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REPORT
on the
PRELIMINARY INSPECTION
of the
AIR CUSHION ICE-BREAKER BOW (ACIB)

Prepared by: J.A. Tarzwell

Prepared for: Transportation Development Centre, Transport Canada

Date: 29 November, 1982

Contract No.: D1460-163-14-7

german & milne inc.

1. INTRODUCTION

Limited tests of the Air Cushion Ice-breaker Bow (ACIB) were carried out at Thunder Bay during the latter part of the 1981/82 winter season. Because of the late start, the tests were inconclusive since they were conducted in flexible spring ice which is considered to be the worst condition for air cushion ice-breaking. Further, only a small range of ice thicknesses were encountered during the tests (610mm to 915mm). Additionally, a number of design deficiencies were identified which required correction prior to further testing.

In order to complete the evaluation and to explore the full operating envelope of the ACIB, the Transportation Development Centre established a plan to carry out certain essential repairs and modifications to the craft and to conduct further tests over ice of varying thickness, using one or more host ships, during the 1982/83 winter season. This plan entailed the selection of a prime contractor who would be responsible for the preparation of the test plan, the implementation of the essential repairs and modifications to the ACIB and for carrying out trial operations. German and Milne Inc. was selected following competitive

.../2

bidding in response to DSS Request for Proposal 10SD.T8200-2-2527.

As a prerequisite to the repair and modification program, it was necessary to carry out a preliminary inspection of the ACIB to identify the essential work to be done. Accordingly, the referenced Transport Canada service contract was raised with German and Milne for this purpose.

This report covers the results of the inspection, and is submitted in accordance with subparagraph 2.3 of the Service Contract. As required by paragraph 4, Appendix A of the Contract; the inspection program entailed the following:

1. Check-out of the ACIB subsystems to insure safe operation.
2. Movement of the ACIB as necessary to permit partial dismantling.
3. Dismantling of spary aprons, skirt segments and notch structure, to permit access to the ACIB main structure.
4. Carrying out a preliminary inspection of all systems in order to permit costing of the proposed modification and repairs, and the identification of possible structural weaknesses.
5. Preparation of an inspection and evaluation report for TDC and CCG guidance.

2. CHECK OUT OF THE ACIB SUBSYSTEMS

As a result of the high water level experienced in October 1982, the lakeward side of the ACIB was awash. It was therefore necessary to put the ACIB on hover and winch it ashore about 5m to provide access for removal of the spray aprons and skirt segments for inspection and repair. Prior to undertaking the movement of the ACIB, a check out of its subsystems was required to ensure safe operation. To this end the following checks were performed:

1. Engines: New batteries installed,
   Oil and oil filters changed,
   Emergency fuel tank filled,
   Test run of each engine performed.
2. Fans and Inlet Guide Vanes: Functionally checked.
3. Notching Winches: Functionally checked.
4. Transit Winches: Functionally checked.
5. Winching cables: Inspected.
6. Local and Remote Controls: Functionally checked.
7. Spray Apron, Skirt Segments, Notch Segments: Inspected.

.../4

All subsystems functioned satisfactorily during the checks, and the inspections revealed that there was no damage to spray aprons, skirt segments or notch segments other than as previously reported in RFP 10SD.T8200-2-2527, reference A. It was, therefore, concluded that the ACIB would be safe to operate on hover for the movement ashore.

3. MOVEMENT OF THE ACIB

In preparation for the movement of the ACIB, the following work was performed:

1. The washed-in debris was removed from the shoreward side of the beaching pad,
2. The Harbour Commission boathouse windows were covered with plywood as protection against flying stones,
3. Four ballast blocks were positioned near the port side of the ACIB as an anchor point for the port transit winch cable,
4. The previously installed earth anchor on the starboard side of the ACIB was freed up for use as an anchor point for the starboard transit winch,
5. A TD-25 Bulldozer (wt. 80,000 pounds) was positioned approximately 70m astern of the ACIB, aligned with its centerline, and
6. About 40m of cable was paid out from the TD-25 winch and the two notching winch cables attached to it.

The TD-25 Bulldozer was used as an anchor point for the notching winch cables, rather than the two previously installed earth anchors astern of the ACIB, in order to obtain a horizontal pull rather that the downward pull that would have resulted with the cables attached to the closer-in earth anchors.

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For the movement further ashore, the ACIB was placed on hover with the engine speed set at 1500 RPM. The craft came up to the nominal hover height and was winched astern approximately 5m by alternately winching in the notch winch cables and paying out the transit winch cables. The ACIB moved astern smoothly with no problems being encountered.

4. DISMANTLING, INSPECTION AND WORK DEFINITION

As of 29 October 1982, the spray aprons and all of the notch segments complete with segment supports had been removed from the ACIB. The skirt segments had yet to be removed. In preparation for a meeting in Ottawa on 1 November with Transportation Development Centre and Coast Guard personnel, an inspection of the ACIB to the extent possible was carried out and preliminary cost estimates prepared. For these purposes, Reference 4 of RFP 10SD.T8200-2-2527 ''Suggested Changes and Repairs/Defects'' was used as a guide. A report on the results of the inspection and a list of proposed repairs and modifications and their estimated costs were tabled at the meeting. (Copy of the minutes of the meeting attached as App.A) The list of repairs and modifications was reviewed in detail and priorities assigned to the various items as shown in the attachment to the minutes. The 'B' priority items were to be deferred insofar as the immediate program was concerned but would be performed prior to putting the ACIB into operational service.

In order to clarify the changes proposed in TDC Memos of 12 May 1982 and 3 August 1982 (File

.../8

D1460-163-2), a further meeting was held on 5 November 1982 in Montreal attended by Messrs. Laframboise and Tarzwell. On the basis of the guidelines provided in these two meetings a further inspection of the ACIB was made subsequent to the removal of all of the skirt segments.

From the observations and assessments made during this inspection, a revised list of essential work and its estimated cost was prepared. This list formed the basis of a subcontract with Vulcan Machinery and Equipment Ltd. of Thunder Bay for the accomplishment of the work.

JAT/jf

Minutes of a Meeting on the Air Cushion Ice Breaking Bow (ACIB) Program

Date: 1400, Monday, 1 November 1982

Location: MOT Conference Room, 8th Floor, Tower A Place de Ville, Ottawa

Present:

J.E. Laframboise (Chairman) - Transport Development Centre (TDC)	
M.A. Ball	MOT/CCGV
P. Cojeen	German & Milne Inc
J.A. Tarzwell	German & Milne Inc

DISCUSSION

1. Purpose of the Meeting

The meeting was called to review the work performed under the preliminary inspection contract (TC File No. D1460-163-14-7) and to establish priorities for the essential modifications and repairs to the ACIB to be performed under the implementation and management contract. (Ref: RFP 10SD.T8200-2-2527, August 31, 1982).

2. Inspection

Mr. Tarzwell tabled a summary report (copy attached) on the inspection activities to date. He described, briefly, the preparations for, and the accomplishment of the movement of the ACIB into a more favourable position on the beaching pad. He noted that the operation had proceeded smoothly and that no problems had been encountered. On the inspection aspects of the contract, he said that the list of problem areas contained in Reference No. 4 of the above referenced Request for Proposal was used as guide for the work performed. As of 29 October 1982, all problem areas had been examined with the exception of the notch segments and notch segment supports. These had been removed from the ACIB but not, as of that date, thoroughly inspected. This would be done prior to the final reporting date of 15 November 1982.

2. Inspection (Cont'd)

As required by the inspection contract, cost estimates were made for all repairs and modifications judged to be essential or near-essential to the accomplishment of the test program with the exception of those which would have to be made to the notch segment assemblies and the skirt segment supports. Estimates for this work would have to await the completion of the inspection and further study of the proposed modifications. For preliminary planning purposes the costs quoted in the RFP were used.

3. Essential Modification and Repairs

Mr. Laframboise reafirmed the TDC policy that only the modifications and repairs essential to the accomplishment of the 1982/83 trials were to be undertaken. On this matter, Mr. Ball pointed out that the most critical items to be addressed were:

a. Sealing of all deck air leaks,
b. Improvement of spray suppression,
c. Installation of soles on all skirt segments,
d. Improved method of skirt segment attachment,
e. Making the ACIB fully controllable from the host ship's bridge, and
f. An improved notch seal.

Regarding the latter, he said this would intail the refurbishment of all notch seal segments, developing a method for holding down the rear end of the segments so that all vented soles are level and in contact with the surface of the water, improved rub aprons and improved spray suppression in the Vee formed between the apex of the ship's bow and the notch segments.

Mr. Ball stated the need to provide a flexible, ice-shedding cover over the outer work area of the deck. He said that although the provision of such a cover might not necessarily be undertaken at this time, nevertheless, a cost estimate should be prepared for consideration.

3. Essential Modification and Repairs (Cont'd)

For the detailed discussions on the repairs and modifications, Mr. Tarzwell provided a list of preliminary cost estimates for the items judged to be essential or near-essential to the test program, (copy attached). This list was reviewed and priorities assigned as shown in the margin of the list. Those items designated as proiority "A" would be completed prior to the commencement of the test program and those designated as priority "B" would be deferred for later consideration when the future use of the ACIB was established. It was recognized that some changes might have to be made to the priority "A" repair and modification program as the work progressed and other problem areas were revealed.

A summation of the estimated costs of the "A" items indicated that the essential work could be accomplished within the budgetary allocation of $200,000 leaving approximately 10% for contingency. It was agreed that German & Milne would proceed with the preparation of detailed statements of work for these items as soon as the Implementation and Management contract was let.

4. General

Mr. Laframboise recommended that the ACIB electrical system be thoroughly checked out since incipient short circuits had been encountered in previous operations. He also recommended that the craft be grounded when beached. Further, he noted that the battery charging system was suspect and should be checked out.

On the question of repair and modifications to the engine enclosures to increase the effectiveness of the automatic fire suppression system, Mr. Ball questioned the need for undertaking this work prior to the test program, since the craft would be manned at all times and hand-held extinguishers could be used for this purpose. He also noted that these extinguishers should be of the Halon type rather than CO_2 since they would be exposed to temperatures lower than -20°C.

Regarding the fuel vent valve problem, Mr. Ball said that the valve manufacturer, Wiggins, had informed Bell Aerospace that problems would be encountered when more than two tanks were interconnected, and that a

4. General (Cont'd)

modification to the valves would be needed to accommodate the three tanks on the ACIB. Mr. Ball said that he would follow up on this.

Regarding the supply of skirt material, Mr. Laframboise said that a 10 meter roll was stored at Thunder Bay, and that some spare spray apron sections were held at Grand Bend by Bell Aerospace. Arrangements would be made to have these shipped to Thunder Bay. On the topic of fasteners for the interconnection of apron segments, Mr. Ball said that British Hovercraft had a superior fastener design and that he would get the details of it. In discussing the replacement of the notching winch cables, Mr. Ball noted that the new cables should be terminated in a 4-foot eye to fit over the Alexander Henry's bollards.

5. Adjournment

The meeting was adjourned at 16:30.

Prepared by:
J.A. Tarzwell, Special Project Office
GERMAN & MILNE INC.

Attachment to Minutes of
ACIB Meeting, 1 November 1982

COST ESTIMATES
ACIB REPAIRS AND MODIFICATIONS

ITEM	REFERENCE	AMOUNT	PRIORITY
1. Handrails	RFP, Ref 4 no 1.4	1,640	A
2. Deck Sealing	RFP, Ref 4 no 1.6	1,600	A
3. Excess cables and deck lighting	RFP, Ref 4 no 1.2/1.16	12,000	B
4. Overhead cables & piping	RFP, Ref 4 no 1.9	7,560	B
5. Reroute fuel line-ladder	RFP, Ref 4 no 1.10	1,600	A
6. Notch rollers	RFP, Ref 4 no 1.14	4,300	A
7. Insulate & Sound proof Howdah	RFP, Ref 4 no 1.17	1,800 +	A
8. Install heater in Howdah	RFP, Ref 4 no 1.18	1,900	A
9. 110vac, 60Hz generator	RFP, Ref 4 no 1.20	12,800	B*
10. Skirts-support structure mods	RFP, Ref 4 no 1.21	40,000	A
11. Skirt segment soles	RFP, Ref 4 no 1.22	15,000	A
12. Spray apron - shorten links	RFP, Ref 4 no 1.23		A
Skirt segments - remove & repl.	RFP, Ref 4 no 1.22	4,100	A
Replace short bolts	RFP, Ref 4 no 1.25		A
13. Notch segment refurbishing	RFP, Ref 4 no 1.26	10,000	A
14. Hydraulic package cover	RFP, Ref 4 no 2.1	2,200	A
Hydraulic filter supports	RFP, Ref 4 no 2.2		A
15. Change hydraulic balance line	RFP, Ref 4 no 2.8	700	A
16. Replace Transit Cables	RFP, Ref 4 no 3.2	4,000	A
17. Replace Notching cables	RFP, Ref 4 no 3.2	3,100	A
18. Port Colborne fairleads	RFP, Ref 4 no 3.3	13,800	B
19. Operating instruction plaques	RFP, Ref 4 no 3.7	300	A
20. Fuel tank vents	RFP, Ref 4 no 4.2	2,000	A
21. New battery boxes	RFP, Ref 4 no 4.4	1,600	A
22. Engine panel door locks	RFP, Ref 4 no 4.5	200	B
23. Fire extinguisher covers & brackets	RFP, Ref 4 no 4.6/4.8	700	A

* Rental of a smaller unit being investigated.

COST ESTIMATES
ACIB REPAIRS AND MODIFICATIONS

ITEM	REFERENCE	AMOUNT	PRIORITY
24. Seal engine compartment	RFP, Ref 4 no 4.9/4.11	400	B
25. Seal guide vane actuator shaft	RFP, Ref 4 no 5.1	500	B
26. Fan inlet deflectors	RFP, Ref 4 no 5.3	3,000	A
27. Fan bearing sight glass	RFP, Ref 4 no 5.4	300	A
28. Hydraulic reservoir heaters	RFP, Ref no 2	3,000	B
29. Extend Notch segment supports	RFP, Ref no 2	45,000	A
30. Notch apron, wear apron mods	RFP, Ref no 2	6,000	A
31. Miscellaneous: communications lifelines, etc.	RFP, Ref no 2	10,000	A
	TOTAL (All items)	211,100	

ADDED ITEMS

1. Rotate rollers 180° (in lieu of 18)	1,800	A
2. Deck awning	15,000	B+
TOTAL (A and B+ items)	177,640	

POOR

QUALITY

ORIGINAL